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ABSTRACT

The eight papers in this collection focus on the preservation of both print and nonprint library materials: (1) "Properties and Problems of Modern Papers" (D. J. Priest, United Kingdom); (2) "On the Origin of Papermaking in the Light of Scientific Research on Recent Archaeological Discoveries" (Jixing Pan, China); (3) "Researches in New Conservation Methods in the State Library of the Czech Socialist Republic-Prague and Their Effect" (J. Hanzlova, Czechoslovakia); (4) "On Terminology in the Field of Document Conservation. Some Problems" (Z. P. Dvoriashina, USSR); (5) "The Control of Insects in Libraries and Archives" (M. L. Cox, United Kingdom); (6) "FORMAT--Canada's Computerized Information System for Audiovisual Materials" (Donald Bidd, Canada); (7) "A Strategy for the Preservation of Audiovisual Materials" (Peter C. Mazikana, Zimbabwe); and (8) "Progress in the Preservation of Audiovisual Material" (Helen P. Harrison, United Kingdom). (CGD)

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Division of Management and Technology

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SECTION ON CONSERVATION

Sessions: 84 Tuesday 08.30 – 10.00
92 Tuesday 10.30 – 12.00

Properties and problems of modern papers *(128-CONS-2-E)*	D J Priest University of Manchester UK
On the origin of papermaking in the light of scientific research on recent archaeological discoveries *(93-CONS-1-E)*	Jixing Pan Beijing China
Researches in new conservation methods in the State Library of the Czech Socialist Republic-Prague and their effect *(129-CONS-3-E)*	J Hanzlova State Library Prague CSS

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SECTION ON CONSERVATION ROUND TABLE ON AUDIOVISUAL MEDIA

Joint Meeting
Session: 103 Tuesday 13.00 – 14.30

A strategy for the preservation of audiovisual materials *(135-AVM-CONS-4-E)*	Peter C Mazikana National Archives Harare Zimbabwe
Progress in the preservation of audiovisual material *(136-AVM-CONS-5-E)*	Helen P Harrison Open University UK

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PROPERTIES AND PROBLEMS OF MODERN PAPERS

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ABSTRACT

By modern papers is meant those made since the mid to late nineteenth century largely from woodpulp by either mechanical or chemical pulping methods. By choosing a suitable mix of fibres and treating them in appropriate ways, the paper technologist can control the properties of papers to meet specific requirments. Most properties, especially strength and colour, deteriorate with the course of time, and this article outlines the main mechanisms responsible for the decline. An appreciation of these matters is important in caring for existing books and document, and in planning for the use of longer lasting materials in the future.

1. Introduction

Paper has now become such a commonplace material that it is easy to neglect the complex technology which lies behind its production. We daily encounter paper in many different forms; as a protection for other articles in various forms of packaging: as a functional commondity in tea bags, kitchen towels, bank notes, tracing paper and so on – the list is far from complete. Paper based materials exhibit a wide range of characteristics; compare for instance, the properties of a rigid three layer corrugated boxboard with a single ply soft toilet tissue

The connecting theme is that the manufacture of all these varied materials involves the formation of a matted fibrous network by draining the water from a dilut suspension of fibres through a fine mesh screen. The task of the paper technologist is to manipulate the forming process and other features of the manufacturing method in order to make a product which has the required properties to meet the needs of the end user. Although simply stated, this objective requires that the properties needed can be defined and measured and that the process can be deasigned, operated and controlled to meet the defined need economically; this is what leads to the sophistication of modern day papermaking.

When a book, or other paper based product, is first made, the properties of the paper used are normally well suited for the purpose. However, as time goes by, various external and internal factors operate on the paper and its properties tend to deteriorate untill, in the worst cases, it becomes completely inadequate for its designed purpose, as when the pages of a book become too brittle for it to be handled

It is the purpose of this paper to describe the nature of the more important types of deterioration, and to do this in terms of the properties of paper: in other words, as the title says, to deal with the properties and problems of modern paper. In this context, the term 'modern' is taken to mean papers made since the mid to late nineteenth century, mostly by machine and from various forms of woodpulp. It will be necessary to include a brief account of how such papers are made

2. Basic nature of papers made from woodpulp

By far larger proportion of modern papers will have been made from woodpulp, although it should not be forgotten that other fibres (e.g. cotton, esparto grass and bagasse) are used for some grades of bulk tonnage papers. Wood is largely composed of a great number of specialised plant cells which are fibrous in form and which are joined and consolidated by means of an infiltrating rigid material called lignin.

The first requirement is to obtain fibres from the wood which can be reassembled into matted sheets of paper referred to above. The processes, known as 'pulping', which are many and varied, are based on two distinct principles.

In mechanical pulping the wood is broken down into fibrous fragments purely through some means of mechanical disintegration. Large grind-stones can be used, hence the term 'ground wood'. Mechanical pulp does not make strong paper; it is used mostly for products like newspapers or 'paperback' books.Its attraction is that the yield is high, i.e. a high proportion of the wood can be turned into paper.

Chemical pulping, on the other hand, does not yeild such a high proportion of the wood, but generally gives longer, purer, less damaged fibres which can be made into strong papers. Chips of wood are heated under pressure in the presence of various chemicals dissolved in water, and the reinforcing lignin is largely dissolved away. The result is called 'chemical pulp', but note that the wood 'chemical' is not an adjective describing the pulp – which is relatively pure cellulosic wood fibre – but refers only to the fact that chemicals are used in the process.

An important current trend in pulping technology is to employ processes wich contain elements of both mechanical and chemical pulping, the aim being to obtain higher quality fibres at high yield. One such variant is Known as 'chemithermomechanical pulping.

For both basic processes, bleaching is required to give paper with the familiar white or cream tints. Some bleaching methods reduce the lignin content of pulp whilst others do not; since bleached lignin reapidly turns yellow on exposure to light this distinction is important for the retention of properties with time, a point discussed further below.

Papers usually contain a blend of different types of pulp from different varieties of tree, the major destinction being between softwood, or coniferous, and hardwood, or deciduous, trees; the former yield longer fibres than the latter. The choice of pulps to suit and end-use is a complex and important factor in paper product design. Papers made entirely from 'chemical pulp' are commonly known as 'wood free'. This is an example of the occasionally awkward papermaking jargon (1); such paper is usually all woodpulp – the term is an abbreviation of 'groundwood free'.

An important step in papermaking is the procedure known as beating or refining in which a suspension of fibres in water is subjected to intense mechanical action. This causes complicated changes in the nature of the fibres, which become more flexible and conformable. As a result, up to a certain limit, the greater the extent of beating, the denser and stronger the sheet becomes. Variations in the nature and extent of beating is a futher highly important means of controlling the properties of the final product.

The dispersion of beaten fibres then passes to the moving wire screen of the papermachine (which, these days, can be very wide and fast) where it is formed into a sheet. Further along the machine it is pressed to remove some of the water and to consolidate it, and dried.

Various materials may be added to the basic fibre network, during or after processing, including fillers such as clay or chalk, sizing agents to give the paper resistence to wetting and starch to increase strength (especially to prevent fibres being 'picked' from the surface of the paper during printing).

3. Categories of paper properties

Properties required by book papers and the like fall into the following four categories.

a) Mechanical, e.g. strength to resist folding, handling and passage through printing and other processes.
b) Optical, including colour, brightness, opacity and gloss.
c) Surface properties, in particular smoothness, strength and compressibility.
d) Properties relating to interaction of the sheet with other materials, such as aqueous fluids or printing inks.

These properties will now be discussed in the context of problems which arise as they change with time or exposure to adverse conditions or both; note that there is considerable overlap and interaction between the various categories.

4. Strength

The loss of cohesive strength in the paper of huge numbers of books in library collections is arguably the most serious problem in library conservation, since eventually the paper in these books cannot be handled without it falling apart. There are many ways of measuring different aspects of the strength of paper – a statement which may, at first sight, seem unlikely in apparently so weak a material. In fact, however, when expressed in like terms the strength of paper is comparable to other materails like metals or concrete. A common method is to steadily stretch a strip of paper and measure the increasing force transmitted by the strip until it breaks. The force, or load, at this point is known as the tensile strength. It is indicative of the likely performance of the paper in use, and as we shall see, can also be related to some basic structural aspects of the paper. A less precise test, but one which is particularly sensitive to loss of strength on ageing, is the fold endurance test in which a strip, subjected to a low stress, is folded to and fro in a well defined way in a special instrument until it breaks, the result being expressed as a number of folds to failure.

The source of tensile strength in paper lies both in the strength of individual fibres and in the strength of the bonds between fibres; if either one of these is absent, the paper will have no strength (2). Strength can be further analysed in terms of, amongst others, the

length of fibres and its distribution, the cross-sectional area of fibres, and the fraction of fibre surface that is bonded in the sheet. Some qualitative appreciation of these factors can be obtained by looking at photomicrographs of paper – a typical example is shown in Fig.1 (3). Each individual fibre has a complex substructure based ultimately on long chains of cellulose molecules grouped into tiny bundles called microfibrils. These microfibrils are orientated in the fibre in various directions in a number of different layers, as shown schematically for a softwood fibre in fig.2 (4). Along their lengths microfibrils have a high tensile strength because of the strong chemical bonds between the thousands of identical units making up each cellulose chain. Should these bonds be broken in sufficient number, then the strength of microfibrils is reduced, which, in turn, reduces the strength of individual fibres and hence the strengh of paper itself. This can happen, of course, without any visual effect applied in handling or in some kind of tensile test that the weakness becomes obvious.

5. Causes of loss of strength

Unfortunately, the cellulose molecule can undergo certain types of chemical reaction which do result in bonds breaking along the chain and this is basically the reason for all the problems with embrittlement in books containing modern paper. In outline, there are two types of reaction involved, hydrolysis and oxidation. Hydrolysis means that when a bond breaks, a molecule of water takes part in the reaction; oxidation implies the uptake of a molecule of oxygen. However, on its own, cellulose is extremely inert and both types of degradation require the involvement of other substances. Hydolysis is most often brought about by hydrogen ions linked with the presence of acidic material in the paper. It is very likely that the single most damaging factor is the widespread use of aluminium sulphate – papermakers call it 'alum' – in conjunction with rosin to produce paper with resistence to wetting i.e. sized paper. Although alum itself does not contain hydrogen ions, when it is dissolved in water it releases some hydrogen ions from the molecules of water. Programmes of deacidification, whether on a small or large scale , are aimed at eliminating hydrogens ions from the paper, thus arresting the degradative reaction. It is important to realise that in none of these deacidaification methods are chemical bonds reformed within the cellulose, and already weakened paper reamins in that state after treatment. A different approach is required to strengthen weak paper, such as in situ polymerisation, research on which is being sponsored by the British Library (5). For reasons almost entirely unconnected with permanence or conservation, synthetic non-acidic sizes are now being used to an extent in the paper industry, and this has led to the economic practicability of producing papers for publishing which are far less likely to suffer the same acidic decay in the future. A recent Americal National Standard for permanent paper for publishing gives some specifications (6). Other sources of hydrogen ions are atmospheric pollution by acid gases such as sulphur dioxide, an aspect of which has been studies in our laboratories at UMIST (7); breakdown of lignin, if the paper contains it; and organic acid groups introduced if chemical pulping conditions are not properly controlled – but these are problems of less widespread importance than alum rosin sizing. Sources of acidity have been summarised by Hey (8).

Oxidation, the second type of degradative reaction, is also generally less of a problem than acid hydrolysis due to alum. However, it can be accelerated by the presence of minute quantities of certain metallic salts, such as those of copper and iron, and these can be picked up by the paper from processing equipment.

6. Optical properties

The chief problem here is concerned with changes in colour which take place on ageing. The yellow-brown colour of pages in some old books, usually more intense near the edges, is well known. Many mechanisms may be operating; space precludes a full discussion. Once again, however, one aspect is of particular importance, and this is the pronounced effect of light on papers containing lignin, which rapidly discolour. This is most obvious in cheaper papers contianing mechanical pulp, as used in newspapers or paperback novels, and the disolouration is usually accompanied by embrittlement.There is a clear and generally well recognised need to control the extent to which such papers are exposed to light. The newer high yeild hybrid pulping processes (e.g. the chemithermomechanical process already mentioned) are likely to give some new problems with colour change because although they may appear initially well bleached, white and bright they still contain substantial proportions of lignin which will rapidly dicolour. As the pulps are stronger and of better colour than straight mechanical pulp, they are finding their way into some applications where at present woodfree pulps are used. Although manufacturers readily acknowledge that they are unsuitable for long-life paper, it is important for library conservators to be aware of the development.

Figure 1. Photomicrograph of the surface of paper, showing the fibrous network and overlapping fibres bonded to one another.

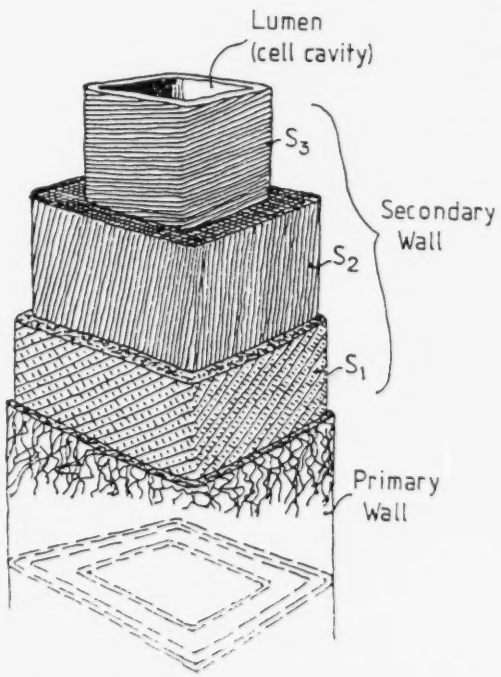

Figure 2. Diagram illustrating a typical arrangement of microfibrils in the various layers of the wall of a softwood papermaking fibre.

7. Other properties

Sizing has already been mentioned in connection with strength. In modern papers, as defined here, sizing nearly always means the use of small proportions (1-2% by weight) of rosin to make the fibre surfaces water repellant; it should strictly be termed 'internal sizing'. This is different from the earlier use of larger proportions of gelatine or glue as a 'size' to strengthen paper and give it some water resistance, the term for which is 'tub-sizing'. Its modern equivalent is called 'surface sizing' which is the treatment of dried paper on the paper machine by passing it through a solution, usually of starch, and re-drying, mainly to improve surface properties. In library conservation, surface properties are not normally a major problem, although it must be recognised that if paper is wetted and redried the surface texture is inevitably and irreversibly altered, espeecially if the paper has been well smoothed by calendering.

8. Conclusion

This contribution has summarised, in all too brief a fashion, some important properties of paper which change with the course of time, the mechanisms of such changes, the main factors to be avoided, and how these topics relate to the problems which face those whose responsibility it is to store and maintain collections of books, documents and other paper based artefacts. It is clear that the complex and varied nature of the papers which have been, are being, and will be used in these artefacts needs to be understood and considered both in dealing with existing problems and in planning for an improved situaiton in the future.

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93-CONS-1-E

On the origin of papermaking in the light of scientific research on recent archaeological discoveries

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Papermaking the compass, gunpowder and printing are the four great inventions of ancient China. The invention of papermaking brought about a revolution in writing materials, and played a great role in the development of human culture. According to the record of the historian Fan Yie (397-445), paper was invented by the eunuch Cai Lun (a.61-121) of the Eastern Han dynasty (25-220) in the year 105. But some other scholars of the 8th to 12th centuries thought that there should have been paper before the Eastern Han. The contribution of Cai Lun was thus to make an improved paper from plant fibre.

Which raw materials were used for making paper before Cai Lun ? And who was the inventor of paper ? There has been controversy for a long time about these problems in China and abroad. As to the technique of papermaking in the early time, there were a few writers who studied this topic before. The above mentioned problems were not solved until the 1940's. Before then most people believed that paper was invented by Cai Lun, since there has not been sufficient evidence to disprove the traditional theory. It was fortunate that the development of modern archaeological excavations carried out during this a century in China has provided many valuable practical materials for solving the problems related to the origin of papermaking. Let me enumerate the newest archaeological dicoveries in various places and the results on the unearthed paper.

The late famous archaeologist Dr Huang Wen-Bi first found in 1933 a little sheet of plae yellow paper at the side of a beacon of the 2nd century BC at Lobnor in Xinjiang. It was made of hemp fibre no later than 49 years before Christ and thus was at least 154 Years earlier than the year 105 AD. This important discovery proved that before Cai Lun there actually had been paper made of hemp fibre. But the sheet of paper was destroyed by fire in a war in 1937.

However, in 1957 other pieces of paper were recovered in an old tomb at the Baqiao building site near the city Xi-an in Shaanxi province. It was made no later than 140-87 BC. Before scientific research, it was thought to be made of silk fibre, and the vegetable fibre paper was still invented by Cai Lun. But after we had done a microscopic analysis of it in 1964 and 1980, we found that it was not made of silk, but hemp fibre. Through further research we recognised it was the earliest paper made of plant fibre. We felt greatly honoured to have the opportunity to provide material evidence to prove that paper was actually invented by craftsmen 2,000 years ago in Western Han dynasty (206 BC-25 AD). Since then excavations of ancient paper have been given much attention by archaeologists. Specimens of early paper made before Christ have appeared gradually in various places and wonderful discoveries have been made one by one. In 1973 a professional archaeological team of North Western Gansu province found two pieces of hemp paper made in 52 and 6 BC separately at a military post, Jinguan, at a point of the bank of the River Erjina, near the Western end of the Great Wall. Five years later in December of 1978 archaeologists found a collection of miscellaneous items in a ceramic pot on an architectural ruin of the 2nd to 1st centuries BC in Zhong-yan village, Fuf eng county, Shaanxi province. When they put the findings from the ceramic pot in order they discovered two pieces of paper among the findings. After analysis in 1980 we recognised it as hemp paper. It belongs to the Emperor Xuan's reign period (73-49 BC).

The newest one was discovered in 1979. A professional archaeological team of Gashu province found a lot of wooden tablets and other things including eight pieces of hemp paper at a beacon ruin of the Western Han at Majuan-wan, North Western suburb of the famous Dunhuang county on the Silk Route. They were made in the 1st century BC to the very begining of the Christian era. We made a microscopic analysis of it in 1980 and proved they all were made of hemp fibres. In short, plant fibre paper made of hemp datable before Christ has been excavated five times in various places in China in 1933, 1957. 1973, 1978 and 1979. Their dates were all determined by experts in published reports. Four of these samples of excavated paper have undergone microscopic analysis by us and other scholars in laboratories several times. According to our analysis all paper dated before Christ was made of hemp (*Cannabis sativa L*) and ramie (*Boehmenia nivea Gaud*). Not one piece was made of silk fibre. The mean length of the paper fibre is 1-2.2mm, and mean width is 19-21mu(one mu is equal to one thousandth mm). The mean length of raw hemp and ramie is 12-25 and 120-180mm respectively. This means that the hemp fibre was not raw but treated. All of the fibres were broken up by beating to vaious degrees, though Baqiao paper, the earliest one, was not beaten as later fibres. The excavated ancient paper has a density of 0.28-0.33g/cm^3 which is within the range for common handmade paper. All ancient paper consisted mainly of individual and dispersed fibres interwoven in different directions by beating and pounding.

Apart from Baqiao paper, which is pale yellow, Jinguan paper, Zhong-yan paper and Majuan-wan paper-V all have a brightness of more than 40%. After treating with a reagent of Zinc chloride and Iodine solution (ZnICL) the paper fibres appreared a wine-red colour. This indicates that the raw materials for making paper was digested with a basic solution. In ancient times we often used the ash of puncture wine *(Chenopodium album)* to prepare the basic solution. Because it contains Potassium carbonate (K2CO3) which is the salt of a weak acid (Carbonic acid H2CO3) and a strong alkali (Potassium hydroxide, KOH). so the solution should show the alkali character. On the surface of the Zhong-yan paper Majuan-wan paper we are able to see faint screen marks of the type of the so-called "wove mould". From the preceding observations and technological data we reached the following conclusions:

1. Paper was invented in the Western Han dynasty, in the 2nd to the 1st century BC. Its inventor, therefore, was not Cai Lun, but craftmen whose names are unknown.
2. Paper dated Christ was all made of hemp or ramie fibres, just like that made in the later periods. We have not found paper made of silk fibres before.
3. We have been able to determine the raw materials, characters and outward forms of early paper. With the help of imitative experiemnts done in the field we could also gain a clear idea of the technical processes and apparatus for making early paper.

Now let me describe the flow diagram of papermaking in the Western Han period on the basis of our imitative experiments. Firstly, the raw materials (rags, used fish-nets, waste hemp, rope stubs, etc.) were put in and then cut into smaller pieces with an iron axe. After washing carefully in the river either with feet or a wooden bar the raw meterials should be treated with a basic solution. Craftsmen burnt some kind of plants (puncture vine is the best one,) then mixed the vegetable ash with water. Through a filter they obtained the solution used for digesting. They put the solution into an iron pot over which there should be an iron grating connecting with a wooden bucket. Put the raw material into the bucket, poured some basic solution on it, and then close the top of the bucket. The raw material should be digested for more than 20 hours and put it in the bucket overnight. After digesting the raw material, was taken out of the bucket and washed in the river, then put into a stone mortar to be pounded into paper pulp. There were two kinds mortars. Then wash the pulp again and put it into a stone or wooden vat to mix with clear water, and stir the pulp continuously. An experienced papermaker put the paper mould into the vat to make a sheet of paper, then took it out of the vat and put it outside. after drying he took the paper from its mould, and stacked up many sheets of paper to cut its four sides. Thus many sheets of paper of the same size were made.

From the above mentioned the problems concerning the origin of papermaking have been settled by scientific research in early samples. It is unnecessary to maintain the traditional theory, since the practice is the sole criterion to examine truth. We believe that there will be new discoveries of ancient paper in the future. The new point of view has been supported by leading Chinese and foreign scholars. Here we want to express our thanks to them. However, has the contribution and role of Cai Lun been entirely negated ? Our answer is no. Cai Lun still should be credited with his own contribution. He summed up his predecessors' technical experiences in making hemp paper and organized the production of high quality for writing. He therefore improved and popularized the technique of making hemp

Technological flow diagram of making hemp paper in the Han Dynasty (221BC – 220AD) in China. *From Pan's book, p.51 (1979)*

paper. Secondly, he led craftsmen to produce bark paper from papermulberry *(Broussonetia papyrifera Vent)*fibre, extended the sources of raw materials for papermaking. Bark paper was actually a product of a technical innovation. In short, he was a technical innovator serving as a link between past and future.

Papermaking, like other ancient techniques could not have been invented accidentally by a single person, but must have gone through a historical evolution. Our experience of making paper taught us that an individual could not perfect the processes of papermaking, which is a collaborative labour. According to historical records, the Chinese brush was invented by Men Tian, a senior general of the Qin dynasty (3rd century BC) but archaeological findings have proved that people started to use writing brushes in the Shang dynasty in the 16th to 12th centuries BC or earlier. This is another respect in which historical records have been disproved by facts. There is no basis to further perpetuate the theory that Cai Lun invented paper.

129-CONS-3-E

Researches in new conservation methods in the State Library of the Czech Socialist Republic – Prague and their effect

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ABTRACT

The results of three research tasks recognized as Czechoslovak inventions are dealt with particularly:

1) Lamination of paper without warming
2) Conservation of historical vegetable tanned bookbinding leather
3) Conervations of historical white bookbinding leather and genuine parchment

The paper further mentions one of the results of the innovating activities in the SL CSR – a designed prototype of a special machine for cleaning and disinfection of library collections.

Information concerning "The Research in the Causes of Endangerment of Historical Library Collections and the Project of their Preservation" can be found in the final part.

In recent decades the historical stock under preservation in Czechoslovak libraries has increasingly been endangered by both the natural process of aging and, particularly, by the degrading chemical and biological effects.

Since in the Czechoslovak Socialist Republic this applies to relatively very large historical holdings / viz. several millions of volums state-wide/ thus endangered, urgent conservation of this stock had to be undertaken immediately, without any unnecessary delay, efficiently and with full sciencebased responsibility.

Since early seventies the State Library of the Czech Socialist Republic in Prague /further the SL CSR/ has there fore been concentrating on systematic longterm research in this field The rationalization and research activities of the SL CSR, in frequent collaboration with Czechoslovak research institutes, have resulted in a number of partial improvements in the techniques of conservation.

The first successful result of a five-year research activity of the SL CSR working in collaboration with the Leather Research Institute in Gottwaldov /Czechoslovakia / in the years 1972-1978, is the new method of conservation of tanned bookbinding leathers.

The research engaged in by the SL CSR was given a strong impetus by the conclusions /drawn on the basis of a worldwide questionnaire preceding that research/ to the effect that some of the conservation methods were in no way scientifically well-grounded, viz. that no deeper inquiry had so far been made into the causes of the degrading processes affecting various kinds of leather and no methods devised to prevent them; that some of the methods of conservation had not been subjected to any analytical checks on their adequacy, and that they did thus in no way guarantee the required degree of effectiveness.

The initial stage of the research was therefore concerned with the main causes of aging and degradation of tanned leathers, the effect of free acids /particularly sulphuric acid/ on leathers, the catalytic effect of cations of heavy metals /particulary iron and copper/, the effect of microbial attack /by bacteria and moulds/ and the attack by insects, and the catalytic effect of solar radiation. Neither should be the dangerous effect of dust and other impurities of various origin be disregarded.

The traditionally applied conserving agents have been subjected to laboratory tests for their efficacy and durability of their effect, and the behaviour of the leathers that have been treated using these agents has been observed under the conditions of artificially induced aging. In order that the effect of the new conserving agents upon the properties of leathers might be ascertained, use was made of the following selection of tests and checks: shrinking temperature, tensile strength, drawability and bending resistance.

The positive results of these tests and checks have proved the efficacy of the new method of conservation, which includes the following fundamental operations:

1 mechanical cleaning: dust and other mechanical impurities are removed from the surface of tanned leather in the usual way;
2 chemical cleaning: the surface of the leather is cleaned with foamy nonionogenic tenside based on alkyl-amino oxide. Dirtier leather surfaces exhibiting rubbed-in impurities and greasy spots or remains of various varnishes are treated with a mixture of organic solvents containing chlorohydrocarbon and nonionogenic emulgating agents. This Cleaning operation is also designed to open the surface of the leather so treated for further conserving agents to penetrate it and to be more readily accepted. /The imbition capacity can be tested using the dropping test./
3 blocking the iron of heavy metals and neutralization: the blocking and neutralizing solution is prepared with due respect paid to the acidity – pH – of the surface of the leather ascertained. The stock solutions for blocking ions and neutralization are mixed with distilled water. The neutralizing solution is based on the hydrogen carbonate of an alkaline metal, which is capable of neutralizing free acids so that the pH value of the leather will approximate to the value of the iso electric point. The blocking complexing agent based on the fluoride of an alkaline metal bonds the cations of heavy metals into stable colourless complexes. The metal ion will thus lose its catalytic effect that has been causing the acceleration of the decay of the leather;
4 greasing: according to the imbibitory capacity of tanned leather two types of greasing mixtures are invariably made use of:
   – for the more imbibing leathers the greasing mixture prepared after the recipe of the British Museum;
   – for the less imbibing leathers the mixture after the recipe of the Leather Research Institute in Gottwaldov /Czechoslovakia/; the mixture has an extraordinary good capacity of penetrating the depths of leathers. It contains lanolin, Japanese wax, hoof oil and extracting petrol as solvent. In order that biocidal protection of leathers may be ensured, the two mixtures are supplemented with an anti microbic component of aromatic chlorohydrocarbon.

Greasing will upgrade the original physical properties of tanned leather, it will soften it and make it more pliable. The protective film of grease and wax, which forms on the surface of the leather, will prevent sorption of harmful subtances from the surrounding atmosphere and ensure better control of the intake and outlet of atmospheric humidity.

The check tests made and the nine-year long practical application of the method have confirmed that conserving procedure devised has a generally favourable effect upon the condition of the bookbindings conserved. This means that the method does not only block the harmful effects of the ions of heavy metals and neutralize free acids, it also acts as a restorer of the original mechanical properties of leather /viz. its softness, pliability, suppleness, elasticity/, and it enhances its resistance to newly emerging harmful effects. The treatment will also upgrade the feel of the leather, it will face-lift the appearance of the leather in general, and will make the blind-tooled and gilded décor stand out more conspicuously.

It is the advantage of the conservation technique described above that the conservative treatment of leather bindings can be administered superficially without the bindings having to be dismounted and then remounted again /which invariably proves to be very laborious and time-consuming/ unless of course they have been damaged to such an extent that dismounting and remounting are unavoidable. The new conservation technology thus also satisfies the requirement concerning minimum time consumption, because the number of historical bookbindings endangered by the process of ageing and degradation, and requiring timely conserving intervention is extraordinarily large.

The newly envolved method of conserving tanned binding leathers recognized as a Czechoslovak invention in the year 1978, has thus achieved its aim: it can put a stop to the process of aging and degradation of leathers delaying it for a period of at least fifty years, provided of course the bindings treated have been appropriately stored. /Note. For more detailed information comp. the paper by the SL CSR publised in "Maltechnik-Restauro", vol. 1, a West German journal, in the year 1981./

Since the method described above has been devised for the conservation of tanned leathers, the second stage of the research of the SL CSR in the years 1980-1984 concentrated upon the technology of conserving white binding leathers and parchments, because these materials are also liable to processes of ageing and degradation, despite their considerable durability. As with the preceding stage of the research, the attention of the research team focused upon the detection of the causes of aging and the accompanying processes of the decomposition of fibrillaty proteins of leather to polypeptides and lowe peptides. This decomposition results in the mechanical and physical properties of leather and parchments getting degraded to a certain extent.

It was found that the character of the causes of the processes of degradation did not substantially differ from the character of these processes in tanned leather. And as soon as these causes had been detected, a conserving procedure was envolved with due account paid to the different manufacturing technology of these materials. This is to say that the new method of conservation also eliminates the causes of the processes of rotting of white leathers and parchments before it furnishes them with the desired resistance to new harmful effects.

The newly devised conserving procedure consists of the following operations:

1 mechanical cleaning: dust and other mechanical impurities are removed from the surfaces of white leathers and parchments in the usual way;

2 chemical cleaning: using the mixture of 80 per cent active organic component and 20 per cent water, cleaning of the surface of the leather or parchment is completed and their grain opened;

3 neutralization and retanning; neutralization of free acids with the help of hydrogen carbonate of an alkaline metal is undertaken with respect to the acidity of the surface – – pH – ascertained. Neutralization is parallelled by the process of retanning using aldehydes, in order that the physical properties of white leather and parchment may be upgraded and the shrinking temperature raised, /because research has proved that old materials get considerably de-tanned/. More perfect penetration of the mixture is achieved with the help of a system of solvents with a low content of water. The mixture is applied until optimum pH has been reached;

4 greasing: in order that white leathers and parchment may be softened and made more flexible and supple, use is made of a greasing mixture containing silicon oil, re-esterified glue grease, white lightfast wax, and chlorohydrocarbon as solvent. For biocidal protection an antimicrobic component is added based on quarternary ammonium salt. If disinfection is required, use can be made of p-chlorine-m-cresol. The protective film of grease and wax on the surface of the leathers and parchments treated in this way has the same function as the greasing components in tanned leathers.

The adequancy and effectivness of the method has been proved for conditions similar to those under which methods of conservation of tanned leathers were tested. The technology of conserving white bookbinding leathers and parchments was recognized as a Czechoslovak invention in the year 1984, because it, too, satisfies the targetted aim, viz. to be capable of stopping the process of aging and degradation of white leathers and parchment for a period of at least fifty years. It has been applied in practice since the year 1985. /Note. The SL CSr intends to publish an article containing more detailed information on the method in the international journal the RESTAURATOR in the year 1987/.

The third invention recognised as Czechoslovak invention in the yeaar 1982 is the new method of cold-lamination of paper envolved to salvage old newspapers.

As compared with the thermoplastic method of lamination, which has been in use so far, or with the method applying REGNAL / a polyvinylacetal conserving agent/, a 1973 Czechoslovak invention, the new method of lamination manifests a number of advantages.

First off, the new method does not require any application of heat; use is made of strong transparent tissue paper /max. 10g/m^2, preferably Japanese, or similar type/ as reinforcing material. Uniting the damaged leaf of paper with the reinforcing tissue paper is effected with the help of a special impregnating compound based on the hydrodispersion of polyvinylacetates and cellulose derivatives. The compound also contains the metal carbonate of alkaline earths as buffer. The resultant pH of the compond equals 8-9. Microbial protection is ensured by an admixture of quarternary ammonium base. The compound does not penetrate through the whole thickness of the paper laminated, which thus does not become transparent. After drying the compound remains pliable, so that the laminated leaf is elastic, does not adopt a yellowish tint or an undesired gloss, and the legibility of the text is in no way reduced owing to the type of the reinforcing paper applied. Another advantage of the new method is the possibility of laminating a damaged leaf on one of its sides only, without the listed laminated exhibiting marks of curling. The leaf thus remains unenclosed, unenveloped, and the socalled breathing of the paper is fully ensured. Also the problem of minimum growth of the orginal thickness of the volume has thereby been solved. Lamination can be applied so as to cover the whole surface of a leaf, or locally only, viz. only the damaged part of the leaf can be treated without the danger of the unlaminated part of the leaf exhibiting any deformation. Also the missing parts of a damaged leaf can be restored, so that from the point of view of the labour expended the method is simple and minimum time-consuming.

If de-conservation is required, the composition of the impregnating compond, and also the cold process, prove to be facilitating factors. The respective provisions of the safety regulations have been fully satisfied thanks to an adequate selection of hydrodispersed synthetic polymers, which are incombustible owing to their dispersion medium and do not contain any toxic solvents.

The cold-lamination method was originally envolved only to salvage the stock of old newspapers. It however found a much wider and successful practical application, e.g. it is at present being used to reinforce highly damaged old rare prints and manuscripts, both bound and unbound.

Since unbound large-size collections /viz. maps, graphic sheets etc./ are particularly liable to deterioration, the applicability of the lamination method has been considerably extended. The procedure has basically remained unchanged, only the reinforcing material is different: use is made of fabrics.

An intergral part of the preservation of a library's holdings is the indispensable hygiene. And ensuring hygienic conditions on a mass scale is in no way a simple task.

The improvement-oriented activity of the employees of the SL CSR has resulted in a preliminary project of a machine for cleaning and disinfecting the library's stock. It is expected that this type of mechanization will considerably raise the productivity of labour of the library's staff, because the task is for systematic hygiene to be maintained and administered to the SL CSR's stock of six million volumes.

Due attention had to be paid to protection of the health of the library's personnel engaged in dusting the volumes and removing dirt, various impurities or microbial germs,as well as the personnel in charge of the following disinfection or disinsectization. The advantage of the cleaning and disinfecting machine, which is now being built, is the doublepurpose applicability and its mobility. The latter then will enable it to be also employed in the more remote depositories of the SL CSR. At present, the first prototype of this is ready to under do functional and performance tests.

In view of the fact that in the eighties of this century the need for a complex solution of the problem of preservation of library stock has become extraordinarily pressing, the SL CSR has embarked on another five-research project, viz. Research into the Causes Endangering Historical Library Stock, and Steps to be Taken Towards its Preservation. It is the aim of this project to suggest a number of concrete and effective measures on the basis of extensive investigation of the conditions of the historical and rare collections of the libraries in the Czechoslovak Socialist Republic.

The work on the research project mentioned above is parallelled by work on another three technologically-oriented research tasks aiming at optimizing the methods of conservation subject of course to regular check tests. The first of these tasks is concerned with the effect of urea upon the colagen fibre of the old script-bearing and illuminated parchments; the second task deals with the choice of the method of bleaching involving minimum destructive effect on the cellulose fibre of the paper, and the third with the determination of the most acceptable type of dispersed adhesive of Czechoslovak provenance for purposes of restoration.

The whole research project is planned to be concluded by the year 1990.

135-AVM-CONS-4-E

A STRATEGY FOR THE PRESERVATION OF AUDIOVISUAL MATERIALS

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While the technological revolution that has characterised the 1970's and 1980's has impacted significantly on information and information

handling, the revolution itself has to some extent been made possible by the manner in which information can with greater and greater ease be aggregated and manipulated. The technological advances and in particular the new medium and formats for recording information have demanded the adoption of new techniques and methods for handling information. For librarians and archivists, it has not been easy to cope with the change, in part because the librarians and archivists have been slow in recognising and accepting the significance and implications of the changes and in part because where this has actually happened it has not proved easy or even possible in certain circumstances to mobilise and secure the resources required to cope with the new medium. Audiovisual materials in libraries and archives have thus to a large extent suffered from both physical and intellectual neglect. It is only within the last decade or so that the realisation has begun to dawn that audiovisual materials are an important component within the general information network and that more attention should be paid to these materials both to ensure their preservation and to enhance their exploitation as sources of information.

The advent and advance of new technology and of the new mediums of information has not been uniform throughout the world. At the risk of oversimplification, it is possible to broadly categorise between those countries in the Developed World which have had the resources to pioneer and take advantage of technology and those countries mostly in the Developing World which have not had the capacity to generate technology and which have thus largely been poor recipients of technologies developed elsewhere. This global imbalance which in economic and industrial terms translates into the now well published North-South disparity has in similar fashion produced differentials in the extent to which librarians and archivists in different countries and regions have been able to interact and cope with the new media, in particular audiovisual materials.

Audiovisual materials are not new to librarians and archivists. For several decades they have been accessioning, processing, storing and making available for consultation a wide variety of audiovisual materials. It is elementary and unnecessary to detail the various types of audiovisual materials that librarians and archivists come into contact with or even to dwell on the specific requirements of each of these in terms of cataloguing, storage or access. There already exists a plethora of manuals and handbooks instructing or advising on how to handle this or that material. Rather, it will be more useful to examine problems that affect a wider spectrum of activity and whose solution can initiate activities and remedies on a more far reaching platform.

It is not unnatural or accidental that more and more attention is being paid to audiovisual materials. As more and more information is recorded on this media and more and more of these materials find their way into libraries and archives so too is there an increased corollary responsibility on the part of librarians and archivists to process the materials speedily, provide suitable conditions of storage and service an ever widening group of users. In turn as more and more use is made of the materials so too do problems related to the fragility of the materials become apparent and urgent, demanding the adoption of strategies for the preservation of the materials.

It is clear that those librarians and archivists operating in a technologically vibrant atmosphere will of necessity have a greater contact with audiovisual materials in comparison with those in less technologically developed societies. Librarians and archivists in Developed Countries have handled audiovisual materials for a longer period, in larger quantities and in a wider variety of formats. In doing so, they have found themselves to be in a comparatively more fortunate situation. With a relatively sophisticated library and archive infrastructure it has to a large extent been possible to make special arangements for the materials and even to establish specialist institutions such as film and sound archives to deal with these materials. These librarians and archivists have also been more fortunate in another regard: they are able to choose and select from a wide variety of products available on the market whether these be audio/video tapes or laser discs, and perhaps subject only to institutional budgetary constraints, to acquire the most advanced and suitable equipment to handle, service and allow usage of the audiovisual materials. Institutions such as broadcasting and television stations have for instance been able to create infrastructures capable of meeting more than just in-house needs. Availability of technology and materials is not however synonymous with satisfactory handling of audiovisual materials. Many institutions in the Developed World continue to make do with less than the bare necessities, accommodated in totally unsuitable premises, unable to catalogue the materials for lack of manpower and unable to satisfy user demand.

Librarians and archivists working in the Developing Countries face an even more difficult situation. Unable to stem the tide of technological advance they find themselves fighting a losing battle as more of the information that they have to handle is produces in audiovisual format. Unable even to provideadequate storage for the conventional library and archive material it becomes an even more difficult task to find adequate storage for the aduiovisual materials which by their very composition and fragility demand an even more stringent and controlled storage environment. Battling with acute shortage of foreign currency, they become subjected to narrow and often unsuitable ranges of supplies and equipment, a problem componded by the propensity of certain vendors to wish to dump obsolete supplies and equipemnt on such markets. Struggling to secure a larger allocation of the available financial resources against such urgent and undeniable national priorities as drought and disease, their plight is worsened by those who would wish to capitalise on the little foreign currency available and to maximise profits from the procurement of adiovisual materials and equipment making the latter excessively more expensive in relation to cost at source. The unavailiability and high cost of audiovisual materials causes problems in two other respects. In the first place producers of audiovisual materials find it very difficult and expensive to deposit copies of their materials in libraries and archives even where these are demanded through legal deposit legisla tion. Libraries and archives on the other hand find it prohibitive to purchase these materials. The second problem relates to access. Assuming that a copy has found its way into the library or archive, it is often impossible to attain a multiple-copy situation where the master can be excluded from usage as a means of preservation.

The foregoing analysis exemplifies the problems that librarians and archivists are faced with when dealing with audiovisual materials. In the meantime many audiovisual materials remain at risk. Colour materials including films and photographs continue to be stored in unconditioned storage gradually fading and degrading; nitrate films requiring the most rigorous and stringent storage conditions fail to find this and yet there is no infrastracture for their transfer to safety film; computer tapes, remain stored in dusty and unsuitable storerooms; audio and video tapes have to be erased for further recording often without any mechanism for appraisal and retention of permanently valuable Information; auodiovisual collections remain inaccessible because they are uncatalogued and the reading equipment is not available or has become unserviceable; microforms become blemished and unusable because there have been no periodic checks and testing.

The preservation of audiovisual materials requires a coordinated and sustained approach at institutional, national and international levels. There are already in existence national, international and non-governmental organisations concerned with audiovisual materials: the International Federation of Television Archives (FIAT/IFTA), the International Federation of Film Archives (FIAF), the International Film and Television council (IFTC), the International Association of Sound Archives (IASA), the International Federation of Library Associations (IFLA), the International Council on Archives (ICA) and numerous others at national and regional levels such as the European film Union. These organisations have concerned themselves with many areas affecting audiovisual materials including cataloguing, conservation, copyright, training, building and access. They have however worked in relative isolation, concentrating on their specific areas of interest. While indeed the Round Table of UNESCO NGO's has brought some coordination, this is far from producing the total harmonisation of effort and activity that is necessary to achieve the desired goals. Recognising that indeed there are specialist institutions which must develop expertise and standards relevant to the specific areas, it must nevertheless be accepted that the vast majority of information handlers are general practitioners dabbling in a wide variety of adiovisual materials. Developments in the conservation of film will have some significance on microforms in as much as they will have some relavance to the video practitioners. A seminar on the storage conditions for audio-tapes will interest others who handle related materials. The problem however, is that many of these efforts are being generated and executed in isolation so that even within on country not all are benefitting from the various programmes and expertise available. If it is accepted that audiovisual practitioners are to a large extent uninformed about developments in related areas, and of opportunities that would normally be within their grasp, then the need is to create a coordinating organ whose primary objective will be the harmonisation of initiatives related to audiovisual work and the dissemination of information in thisfield.

It is also necessary to increase inter-organisational cooperation. As an example, both IFLA and ICA have organs devoted specifically to audiovisual materials in the form of the IFLA Round Table on AV Media and the ICA Committee on Audiovisual Archives. The challenge is to open these organs to cross-representation so that while the IFLA Round Table will have a representative on the ICA Committee, the latter also becomes represented on the IFLA Round

Table. Such direct representation allows for a further understanding of initiatives being developed, enables each organisation to take full advantage of such developments and facilitates the harmonization of activities and the harnessing for fuller exploitation of the scant resources available. It is to be expected of course that organisations such as UNESCO can play their role in furthering work on audiovisual materials and in this respect one welcomes recent UNESCO initiatives.

While action at the above international levels will have far reaching long term effects in ensuring the preservation of audiovisual materials there are other strategies that will resolve some of the problems being faced in the short term. The most pressing problems in the preservation of audiovisual materials relate to storage and conservation. The provision of requisite storage facilities can however only be done with a national context as such facilities comprise a capital development within a given nation. The resolution of this problem must of necessity rest largely within the resourcefulness of librarians and archivists within a given country to fight for and secure the resources that are required. This will however demand a pragmatic approach in many respects. It can be more pragmatic for instance, instead of asking for a grand building sufficient to accommodate all audiovisual materials in air-conditioned storage to draw a distinction between materials for long term storage and those for research and short term use so that the immediate requirment becomes that of accommodating the long term in a smaller and therefore more attainable building. Equally librarians and archivists must learn to market themselves and their services. A professioanl qualification in librarianship or archival studies must be regarded as no more than a basic foundation to which must be added appropriate managerial skills in such fields as financial administration, personnel management and marketing. Only when the librarian and archivist can demonstrate with empiricism the advantages of his service and also show precisely in statistical and cost modules the disadvantages arising from a neglect of the services, can he hope to compete for instance with a water engineer and agriculturalist who can demonstrate that a dam costing so much will benefit so many farmers who will produce so much, feed so many people, and earn that much in foreign currency over a given period of time. The librarian and archivist thus must not just argue emotionally about the benefits of information contained in audiovisual materials but must show clearly the disastrous effects arising from lack of appropriate information in terms of economic and social developmental goals.

Securing suitable accomodation is not easy whether in the Developed or Developing World. In the short term it may be necessary to isolate those audiovisual materials which are for long term retention and request other institutions with the capacity to store them. It may also be possible, whenever there is occasion to construct a new building such as a civic centre, computer centre or film laboratory to negotiate and introduce an audiovisual storage component into the structure. The National Archives of Zimbabewe recently took the occasion of the building of a new Records Centre to incoporate an Audiovisual Archives Unit. In many libraries and archives, audiovisual materials will be found scattered in many locations in different collections. It is necessary to centralise storage both as a way of facilitating storage, handling and servicing, as well as a means of drawing attentions to the materials and their needs. Naturally such a move requires the appropriate cross-referencing.

The preservation of audiovisual materials also requires the appropriate equipment for inspection, rewinding, retensioning or transfer to fresh materials and new formats. While technological advances are making it increasingly easier and cost effective to do the latter, many librarians and archivists will for the foreseable future be burdened custodians of materials and equipment that will be out of date with the existing state of technological advance. In this situation they will, and indeed do so now, find it difficult to maintain the rather outdated equipment or find suitable supplies of materials with that elusive "archive quality". The equipment vendors naturally find it difficult to provide a service to such a small market. If however all equipment and supply requirments were inventoried and made known, and orders were collated and bulked the market would become enlarged and therefore more attractive. Equally, the fewer the types of equipment used by archives and libraries the greater the likelihood of this succeeding. While it would be advantageous for librarians and archivists requiring equipment for audiovisual materials to be able to pick within a limited recommended range, with thus the accompanying assurance of a previously negotiated back-up package, its is clear that there are many constraints in terms of international trading relations, bilateral and multilateral agreements, national promotional schemes and tied-aid that is restrictive of procurement options. However libraries and archives do collectively constitute a significant market factor in this respect and it is necessary to cast aside the constraining factors in order to overcome the problems that are presently being faced.

Accommodation and equipment are only some of the problems being faced in preserving audiovisual materials. Over and above these, it is necessary to have trained personnel to handle the materials at all levels. Without these even the most sopisticated of buildings and equipment are nullified. While there are several training opportunities available the problem is that these tend to be national in scope, of an in-house nature or specific media oriented and not much information is available to those who would wish to avail themselves of the opportunities. The formulation and execution of these programmes in relative isolation also leads to duplication of effort and a wastage of resources. The work that has been done by various international organisations has also tened to be narrow and sectional articulating only the training requirements within that organisation's area of competence. And yet, when all is said and done it is clear that such activities as cataloging, indexing, accessioning, conservation and copyright have many areas of similarities for such materials as photographs, slides, tapes, films and microforms and it is possible to develop standard and norms with near-universial applicability. The work that has already gone on must be applauded but the urgent need now is to achieve more cohesion in order to consolidate the exploitation of the available resourse. The training/education/ curriculum committees that exist in many organisations could be coordinated to realise this goal and equally cross representation can be used to coordinate and harmonise the activities of the various organisations in this respect.

In summary the preservation of audiovisual materials requires a multi-pronged approach to deal with problems of storage, sevicing and accessibility of the materials. Any progress made in the physical rehabilitation of the audiovisual materials must be accompained by the provision of personnel with an understanding of their special requirments. The inability of most institutions to aquire multiple copies of easily degradable audiovisual materials is placing the materials at great risk as single copies are used for consulation. The solution of some of the problems lies in concerted and sustained international action based on greater coordination and mobilisation of resources. Librarians and archivist in the Developing World face acute problems in procuring sufficient and suitable supplies of materials and equipment. Learning from the example of the International Council on Archives efforts to establish an International Microfilming Assistance Fund, it may be prudent to establish a similar fund to assist in resolving the procurement problems faced by many countries. The activities of such a fund combined with a mobilisation and harmonisation of the library and archive market requirements can create the conditions required to assure suitable and adequate supplies of materials and equipment, to reduce significantly the cost and to ameliorate the obsolescence factor for a profession that must of necessity be out of step with technological advance.

136-AUM-CON-5-E

PROGRESS IN THE PRESERVATION OF ADIOVISUAL MATERIAL

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ABSTRACT

Discusses the conservation and preservation of audiovisual material, and the progress made to bring both the problems and solutions to the notice of librarians and archivists. Preservation and conservation are defined inthe context of audiovisual librarianship and this leads to a brief review of the materials to be discussed and their introduction into libraries and archives. There is an indication of the special requirements for av conservation, including the effect of improper storage and handling on the materials. A review of the organisations involved in producing standards and guidelines is followed by some of the principles which have evolved. In conclusion mention is made of further work which needs to be done to raise a general awareness of the problems and improve training opportunities in the conservation of audiovisual materials.

Interest in questons of preservation and conservation of library materials has grown in the past few years. The conventional library materials of books, paper and bindings received attention when it was realised that they were becoming degraded due to some of the materials used in their manufacture, acid components which were

rotting the paper; fungus and mould attacking the bindings and paper, and so on. In the concern for books and printed materials, audiovisual materials were often forgotten. But any interest in library materials has to consider *all* library materials including the major audiovisuals. In addition adusiovisual material is no longer confined to the special libraries or national archives, where the issues of conservation and preservaation may have been confined to a small number of specialists, but is finding its way into all types of library with many more librarians and archivists involved. Conservation in libraries became an important topic as librarians noticed the extent of the existing deterioration. In the 1960s libraries concentrated on collection, but with economic cutbacks in the late 1970s acquisition slowed down and when we turned to the shelves it was to discover a lot of degradation in the quality of the material – - books and paper torn, bindings damaged, mould and fungal growth. In the 1970s audiovisual materials were introduced in greater numbers than before and despite warnings from specialist librarians about the consequences of heavy use, inadequate shelving and bad environmental conditions, there was suprise at the level of deterioration in these newer materials. Much of the blame lay in the neglect of existing collections while aquisition continued unabated. Audiovisual materials have been around in some instances for well over a century and have existed for more than long enough to build up considerable problems for conservation and preservation. Audiovisual materials carry information which needs conservation, therefore the carrier will need conservation.

Up to now we have been using the words conservation and preservation to mean tha same thing. In dealing with audiovisual materials we find that the concepts are different. Preservation and conservation may mean the same thing in the print world, but in the audiovisual world, *preservation*, is regarded as the more rigorous procedure, and includes aspects of restoration and transfer of materials from one medium to another. Preservation also implies long terms archival storage and the maintanence of a record in the best possible condition while *conservation* is the maintenance of a record which allows a reasonable amount of usage at the same time. Conservation deals with good housekeeping aspects and preventative measures such as correct handling and the preparation of material for storage as well as the provision of good storage conditions to prolong the useful life of the material and prevent damage.

Level of collection affects the strictness of the conservation and preservation measures we take. An archive is normally the collection with a responsibiliy for preservation, ie. active restoration and rejuvenation, when and how to copy the material to a new format, and what to do with the original, if anything can be done.

Why conservation?

Before carrying out any programme of conservation we should ask why it is necessary. The aim and purpose of a library is preservation in its widest sense: to collect the documents of the past and of the present and *keep* and *maintain* them so they are *available* to both present and future users. Conservation is about keeping documents in a decent state of preservation. It is also about maintaining a collection in this presentable state and finally it is making the materials available to both present and future users.

Materials

The major audiovisual materials which require control and conservation are:

Moving images: the generic term for film and videograms
Sound recordings
Still images: photographs, slides.

Other audiovisual materials can be a combination of these materials, but neither these nor the three main categories can be treated as distinct and different from one another (see Table). The technologies are converging, notably inthe magnetic recordings of video and sound recordings, the celluloid, acetate base of film and photographs, the laser disc of video, CD and so on. One benefit from this convergence of the technologies is that preservation problems are being taken by all the major agencies concerned, in conjuntion with one another. Expertise is being brought together and research is being carried out into methods of conservation and preservation of all the audiovisual materials.

Any preservation policy for audiovisual materials has to include conditions of storage for a variety of materials. With the possible exception of archives, audiovisual materials are usually housed together, that means film, video, sound recordings and other audiovisual formats all appear in the same collection. Librarians have to take note of this fact when drawing up conservation and preservation policies, and any specifiations and guidelines have to deal with multi media as well as single media collections. A brief look at the existing audiovisual materials will indicate some of the qualities which are demanding the attention of the conservationist.

Film has developed from highly unstable nitrate to material printed on acetate or safety stock. Nitrate film has a built in self destruct mechanism and requires very special storage conditions. We cannot hope to preserve nitrate film and the only solution is to transfer it to safety stock before it starts going bad and becomes volatile. This policy of transfer to suitable stock is often central to the conservation of av materials. Safety film is more stable but has its own problems in the vinegar syndrome, and colour fading plus handling damage from dust, sticky fingers or improper projection. However once recorded, the imgage cannot be removed and in this sense it is permanent.

Advice and research on the conservation of film is in the hands of the International Federation of Film Archives (FIAF) which has recently published an authoritative book on *Preservation and restoration of moving images and sound*, FIAF, Brussels, 1986.

Videograms. Videorecording is the major altenative means of recording moving pictures and sound using magnetic recording. Magnetic tape has some useful qualities such as the capability to wipe or erase a recording and rerecord on the same tape, unlike film. But this very advantage brings its own disadvantages. There is a problem of spontaneous wiping or erasure if certain conditions are not met in storage and use. Videorecordings come in several standards of carrier, format, width, and colour systems, all of which provide problems for conservation. There is an additional complication in that playback machinery and machinery for transfers from one format to another have all to be maintained. Obsolescence of machinery creates one of the worst problems in the conservation of audiovisual materials. Any conservation policy hs to allow for a constant transfer of material from one format to a more up-to-date one, and equipment suitable for replay or transfer has to be maintained in working conditions.

Videodisc is the lastest technology to emerge. Its main advantage for archives was said to be permanence, but recent evidence suggests that it will not last any longer than videotape. Videodisc suffers from something called 'laser rot'.

The most prolific users of videograms are the broadcast companies of the world, and a recent publication of the International Federation of Television Archives (FIAT): *Panorama of Audiovisual archives*, contains valuable guidence.

Sound Recordings. These include the gramonphone record, audiotape, audicassette, compact disc and DAT (Digital Audio Technology), as well as some older recordings like the wax cylinder and wire recordings to be found in archives. Discs stand in a similar relation to tape as film does to video; they are more permanent and more susceptible to irreparable damage in use. Compact disc has the same advantages and disadvantages as videodisc.

Photographic material. These are produced in negative and postitive format, on photographic film which has many of the properties of moving film and many of the same conservation requirements. Slides can be treated in the same category, although they will probably not prove a permanent medium of record. Again it will be a question of transfer of materials to useable copy, but each transfer there will be a deterioration.

Conservation policies Who should be preserving the material? There are different levels of conservation and a division of labour between archive and other collections is necessary according to the function of the particular collection. The tasks of preservation and restoration are normally carried out in archives, but reference collections should be in a position to conserve audiovisual materials. Already several international non-government organisations are investigating conservation of audiovisual materials and drawing up archival specifications and guidelines. Currently there is no lack of guidelines, standards and principles, it is only a question of putting them together in the most useful format. Earlier this year an international technical symposium, sponsored by three of the International Associations involved with audiovisual archives; (FIAF, FIAT and IASA), explored issues of conservation, restoration and obsolescence. In 1986 IFLA published guidelines for the preservation of library materials. Appendices to the guidelines could be drawn up by audiovisual archive associations. This, although it appears a compromise, is the most sensible way to proceed.

Conservation conditions

A conservation policy for audiovisual materials has to provide

conditions for a variety of materials ranging from microfiche to magnetic tapes, often conserved in the same environment. Important considerations for conservation include both storage and handling conditions. The quality of the material must also be investigated. Looking at a number of old recordings in the archives we are forced to conclude that much of the material being saved is not of high *technical* standard but in need of preservation and conservation to remain important information. The audiovisual conservationist is constantly having to make transfers, either because the material deteriorates or because technology improves and provides opportunities to produce more and more acceptable rerecordings. Librarians and archivists have to decide what should be preserved and this means that one of the most important tasks of the archivists, and particulary the audiovisual archivist, is selection of the material to preseve. This simple fact is that you cannot keep everything, and therefore you should be setting priorities on what should be preserved.

The actual storage conditions are critial aspects of any conservation policy, and the three most important factors are temperature, humidity and dust. any attempt to preserve the material should start by providing optimum storage conditions. Optimum temperature and humidity values have been suggested, although there is no consensus, but the most important factor to remember is that all the materials suffer adversely from cycling environmental condition. The single most important aid to conservation is a *stable* environment. Stability is more important than the absolute temperature and humidity levels and most materials will survive for long periods in a working environment of 20°C with 50% relative humidity.

Materials also suffer damage in handling, and the handling of audiovisual materials requires considerable care. Another important factor in any conservation programme is 'preventative conservation'. This is not doing something which will cause damage to the materials you are trying to preserve. Restoration is expensive of labour and materials and preventive measures are therefore the most cost effective.

Summary

There are programmes in existence for the preservation of many of the audiovisual materials, in particular film or video and sound recordings, but photographs are less well served.

Some of the main priorities which delegates might like to consider are:

a. Making the professions which are involved more aware of the problems which exist in the preservation of audivisual materials. That is, developing the awareness and rasing the consciousness level in libraries of the needs for and of conservation.
b. More training in the handling and use and archival possibilities of audiovisual materials.
c. The establishment, and support, of centres of restoration and advice, for the audiovisual materials.

The first two points of course concern an extension of the education of librarians and archivists to include more information about audiovisual materials. This is an international problem and although some training courses already exist they are very often unsatisfactory as long-term solutions. Several methods have been tried such as film schools run by film archives, one week seminars run by Unesco, three month in-depth specialised training carried out by organisations like the BBC or British Council and other longer courses for av archivists and librarians available in area as scattered as Vienna and los Angeles. These courses can be of value to only a few students and few of them are presented on a regular basis or at set intervals.

In May this year Unesco sponsored a meeting with audiovisual archivists to investigate training facilities and needs. It was found that there was a severe lack of training opportunities and recommendations were subsequently made to improve the situation. Training on an international basis present practical as well as financial problems. What is the best way to proceed; should you bring students to an established centre or send lecturers to a regional centre, where one exists, or should you develop distance learning packages to be backed up by tutors in a region. Training the trainers is a very important, perhaps the first consideration.

Sessions at IFLA and other conferences is one way to provide information but much more needs to be done to train the librarian in the principles of conservation and preservation of audiovisual materials. Detailed, regular courses are needed to give students practical as well as theoretical experience.

But first I would suggest that we need a wide discussion of the problems involving many different professions such as adudiovisual archivists, librarians, educators and educational technologists. Only when we have accepted that something needs to be done can we decide what needs doing and how our objectives can best be achieved.

Table 1
NONBOOK MATERIALS

TYPE	MATERIAL
MOVING VISUALS	FILM VIDEOGRAMS including Videotape Cassette and disc
STILL VISUALS	PHOTOGRAPHS SLIDES OVERHEAD PROJECTOR TRANSPARENCIES WALLCHARTS/POSTERS MAPS PLANS
SOUND RECORDINGS	GRAMOPHONE RECORDS AUDIOTAPE AUDIOCASSETTE COMPACT DISC (CD) CYLINDERS – Archival
COMPUTER PROGRAMMES	FLOPPY DISKS DISKS TAPES
COMBINED MATERIALS	TAPE/SLIDE PRESENTATIONS FILMSTRIP/TAPE PRESENTATIONS
SPECIMENS /REALIA	MICROSCOPE SLIDES MODELS ARTEFACTS
MISCELLANEOUS	KITS/PACKS/GAMES
MICROFORMS	MICROFILM MICROFICHE

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Division: Management and Technology
Section on conservation

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ON TERMINOLOGY IN THE FIELD OF DOCUMENT CONSERVATION. SOME PROBLEMS

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On terminology in the field of document conservation. Some problems

Abstract

Document conservation, as a special scientific discipline, formed at the junction of several directions of chemistry, physics, biology, history of arts, and polygraphy. Restorers-practicians have also impressively contributed to its development. This has found reflection in the formation of terminology in this subject field. Apart from this, the history of origination and development of restoration activities in each country left an imprint on the conceptual sytem.

The development of international relations and business ties of librarians calls for an unambiguous comprehension and use of terminology. However the comparison of definitions of terms given in different languages frequently shows dissimilar interpretations, a different semantic filling and hence the different usage of some terms. Apparently the time has come to remove the barriers in the creative communication of researchers and restorers of different countries and work out and coordinate equivalent terms and their definitions.

ON TERMINOLOGY IN THE FIELD OF DOCUMENT CONSERVATION. SOME PROBLEMS

By the present time the conservation of documents in libraries, archives and museums has been definitely singled out as an individual branch of science. It has made its appearance at the junction of chemistry, physics, biology, librarianship, archive studies, the history of art and some other sciences. However, its foundations have been laid by practical restorers. The development of restoration work in each particular country has its specific national features. Besides, in the establishments of the countries belonging to two different systems certain tendencies have taken shape, as the organisation and implementation of measures to restore and preserve documents for a long time to come are concerned. All these circumstances have led to the formation of the terminology system in the field of document conservation. It is subject to constant changes and renewals which testifies to the fact that this science is in the process of development.

Terminology is an important part of every science. The state of the terminology system is a sure indicator of the development level of a certain science. In recent years, the need for a well-thought-out system of terms in the field of document conservation has been growing. That is why terminological studies in this field are being conducted on a wider scale. These studies resulted in the adoption and introduction into practice of the USSR State Standard "Document Conservation. Basic Terms and Definitions" which contains 67 terms. Among the latter are basic, general and the most frequently used terms, as well as those which are not very clearly defined and thus can be used in various meanings. It was in fact the first attempt at creating and unifying a genus-terminological system.

In the process of using this Standard its positive features

have been revealed, as well as some drawbacks and the poor viability of some terms. Such a test of the functional worth and expediency of certain terms is a necessary stage towards their firm inclusion into the respective field of knowledge. In the forthcoming period it is envisaged to revise the Standard and draft a new one uniting both the terminology and technology of the document conservation. It would comprise the best and well tested in practice terms.

An analysis of the terms used in Soviet and foreign publications has shown that the process of the terminology formation is going on separately. In general, new terms appear and are introduced spontaneously. They usually bear the imprint of national or departamental traditions. This hampers understanding between specialists.

The development of international exchange in theoretical and practical achievements in document conservation necessitates the creation of a common basic terminology. It should be devoid of any departamental jargon and be unified to the maximum on the basis of a single genus system. The task is to achieve greater compatibility of terms on an international scale.

The work on terminology can go in two directions: the creation of a professional terminological dictionary and of a Standard which is a more normative document. In our opinion, what libraries need most is a terminological dictionary with equivalents in different languages and brief explanations. On the basis of such a dictionary it would be possible, in the future, to create an international encyclopaedic dictionary with detailed explanation of notions and reflecting the history and technology of document conservation. In fact, such an edition would be a bank of special terms.

The basic tasks of such a dictionary are to unify the modern

terminological system of document conservation, to facilitate the translation of specialised literature and to promote the exchange of the results of research and the contacts among specialists.

The idea of the creation of a dictionary is made especially urgent by the fact that there are very few document conservation terms in dictionaries on librarianship. For instance, the Dictionary of Library Terms issued in the Soviet Union in 1976 there is only one term - stock restoration, which, to our mind,

is not very precisely formulated. The dictionary on bibliology published in 1982 includes no mare than a dozen terms which have some connection with the problem and which certainly fail to reveal the integrity of the document conservation system.

Much more attention to the terminological problems is paid by archive workers who compiled and put out the Concise Dictionary of Archive Terms in 1968 and the first issue of the Dictionary of Modern Archive Terms Used in Socialist Countries in 1982. Although the latter contains terms on document conservation they are far from complete and not always clearly defined. The International Council of Archives is now working over a dictionary of terms on archives conservation, which is a worthy undertaking. The acquaintance with the first edition of this dictionary has shown that there is no principled differences between the archive conservation and document conservation in libraries. So the separation of conservation into an independent branch seems not justified. From this point of view it would be more expedient to compile a universal dictionary of document conservation terms for both archive workers and librarians.

The methodological principles of work over a dictionary include the creation of a terms bank and the construction of terms' definitions.

The selection of terms for a dictionary is the most difficult and responsible part of the job. It is usually done in an empirical way. As the terms bank is mostly composed spontaneously, dictionaries often have such drawbacks as subjectivism, omission of some terms or their wrong selection /some necessary terms may not be included in the dictionary while others, not suitable for this dictionary from the linguistic point of view, may appear in it/. These shortcomings greatly reduce the scientific and applied value of the dictionary. That is why it is very important to determine the principles and criteria of the selection of terms for the bank. These principles and criteria should be based on the clear idea of the notion "term" and the purpose of the dictionary.

At this stage it is also very important to determine what to consider as a "term" - separate words, combinations of words, nomenclature, symbols, abbreviations, and so on. Simultaneously the questions of defining the boundaries of terms are decided, as well as the boundaries between a certain term and that of a general scientific character or from an adjacent field of science. The selection of terms should be accompanied by determining whether there is a possibility of polysemy, synonymy, homonymy and terminological phrasiology. Basically, synonyms, homonyms and polysemy have the right to existence. However, in a professional terminological dictionary polysemy should be avoided, i.e. the cases when one and the same term defines both a process, a quality and an object. This may lead to misinterpretations and interfere with the proper understanding of specialised texts.

When creating new terms one should carefully abide by the linguistic rules, i.e. take into consideration the principles of word-building when introducing new complex words or word combinations. The morphological and syntactical aspects are also of

great importance. The most difficult question to decide upon is the order of words in some multi-component terms. Obviously, the order of components should be determined by their logical ties. For this reason it would not always coincide with the norms of the literary language. For instance, for the Russian language it is most common to place the words defining the most essential features next to the defined word.

The selection of terms is culminated in the compiling of a terms bank which should be assessed by specialists, who are to decide whether the terms accurately reflect the theory and practice of document conservation.

The terms bank includes the terms pertaining directly to document conservation as well as those drawn from the adjacent fields of science, which are widely used in practice and without which it is impossible to disclose the content of other notions. The terms in the bank should reflect all the processes and objects which are an inalienable parts of the document conservation. Probably, it will not only most fully represent the terminology in the field under consideration, but also preserve all its drawbacks, imperfections and inconsistencies. The terms bank would include not only science-based and standardised terms, but also their variants and synonyms, among which would be those which are rarely used, out-of-date and borrowed from other fields of knowledge.

The introduction of new terms is of crucial importance. It should be imperative objectively and coordinated with the terminology in the other fields of knowledge.

The proportion of international terms in vocabularies of various types and purposes is steadily growing. This is only natural and logical, for it makes it possible to coordinate the terminology at the international level and is an objective manifesta-

tion of the growth and development of the international ties.

Terms usually originate in the spoken language of specialists and in specialised publications. It is also possible to use general-purpose vocabularies, standards and adjacent fields of knowledge. First the most stable and frequently used terms are selected and then the rest are added to these basic terms.

When composing a terms bank it is important to determine the terminological system, structure and the hierarchy of individual notions or their groups. Without taking this structure into account it is impossible to build a science-based and objective terminological system.

The last, but no less difficult and important task, is to determine the method of disclosing the terms content. Particularly difficult is the definition of inter-branch terms, for they can have different meaning in various fields of knowledge. It seems expedient to preserve the objectively existing polysemy of the terms and their different definition in different fields of knowledge. However, in the professional dictionary under consideration such terms should have one definite meaning.

As the experience of work over the terminological standard has shown, the most difficulties are involved in the definition of basic terms, their essence, and in the establishment of their gender and aspectual connections with other terms.

For instance, among the basic terms is "document conservation", which is defined as "the preservation of a document by means of a storage regime, stabilisation and restoration". This term is still used both in a broad sense and in a narrow sense which sometimes leads to misunderstanding in communications among specialists. The broad definition in its essence is closer to a general technical term "conservation" which means to protect from damage and destruction by means of special treatment and storage

conditions. In a narrow sense this term is understood as "special treatment", i.e. a method of protecting a document from the destructive effect of the environment factors. We use this term in its broad sense. Even a cursory review of the names of departments and publications shows that such an attitude is correct. For instance, the Document Conservation Department of the Saltykov-Shchedrin State Public Library, American Institute of Conservation, the Institute of Paper Conservation, the International Institute for Conservation of Historic and Artistic Works, Department of Scientific Research and Conservation /British Museum/; being regularly published are Studies in Conservation, The Paper Conservator, and Conservation News.

However, the relationship between the terms "conservation" and "restoration" is not sufficiently clear which can be seen from such titles as the laboratory of conservation and restoration of documents under the USSR Academy of Sciences and the Scottish Society for Conservation and Restoration.

It is high time to reconsider some of the traditional concepts, which will help to obtain a clear-cut and simple conceptual apparatus of the document conservation.

It seems that the most urgent and complex problem to be tackled when compiling multi-lingual dictionaries is to select the equivalents for the terms. This work will require a thorough study of national traditions and general tendencies in the development of terms. The linguistic principles of term-forming should be also taken into consideration.

Naturally, terminological studies should be based on linquistical studies to be conducted with the help of experts - linguists specialising in term-finding.

As there have been no thorough terminological studies in libraries, at the present stage such a dictionary can be only a des-

criptive one, i.e. to describe the existing terminology as it has taken shape in the course of history. At the same time, it should certainly be a multi-lingual and defining dictionary, and include as many terms as possible.

At present, in cooperation with libraries in socialist countries, we have started work over a Dictionary of Terms on Conservation of Library Stocks . The purpose of this work is to remove barriers impeding the creative intercourse of researchers and restorers. We think that it will be a defining multi-lingual dictionary, which simultaneously will serve as a source of information and reflect the present state of the development of document conservation, in particular of documents made on traditional materials, for the questions involved in the conservation of such documents have been better studied.

The control of insects in libraries and archives.

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ABSTRACT

A review of the major insect pests in libraries and archives and modern control measures is given.

Insects in libraries may directly or indirectly damage books; damage wooden shelves, furniture, floors etc., and be potential book pests or have some medical importance by causing human dermatitis. The characteristic damage caused to books and other diagnostic aids are described for the important pest species including bristle-tails, termites, booklice, moths, beetles, cockroaches and crickets.

Control may be by treatment of the book, by deep freezing or fumigation, or treatment of the immediate environment, ie. the chemical treatment of book cases, shelves, flooring etc., or pre-site soil treatment.

Introduction

Books, since their origins in the Middle and Far East in the early centuries of the Christian era and reading rolls or codici dating even earlier have been made from animal and vegetable material with the addition of mineral pigments and fillers. The organic matter in books puts them at risk of attack by organisms capable of bringing about their destruction. All book conservators should appreciate

this fact and as Hickin (1985) stated "the destruction of books is a natural process, but man has intervened and tried to modify natural substances for his own purpose. In this case to make the written and printed word last longer".

Physical, mechanical, chemical and biological factors cause deterioration or complete destruction of books. Of these,physical and biological factors are the most important. The latter comprise living organisms which obtain nourishment or shelter from the organic matter content of books. Thus, paper, leather, wood, silk, wool, flour paste or bone gum, common constituents of books for centuries are liable to attack by bacteria, fungi, insects and mites. Only the insects will be dealt with in the present review.

Insects occurring in libraries and archives may be pests because they actually damage books, manuscripts etc.,; damage the surrounding environment by feeding in wooden shelves, floors, furniture and carpets etc., or may possibly cause skin irritation to those working there.

There are many recorded instances of insects seriously damaging paper or books, but it is important to distinguish between instances where the damage is incidental and those where the organic matter in books forms the primary food of the pest.

Insects in the first category cover a wide range of orders and families. Booklice, although recorded as book pests are probably feeding on fungal mycelia growing on paper etc., rather than the books themselves. The beetle families Anobiidae, Bostrichidae, Buprestidae, Cerambycidae and Dermestidae are included in this

category. With the first four families, the most common situation is that books or papers cover the emergence holes of these primarily wood-boring beetles and they are able to eat through whatever lies in their way of access to the exterior. In the last family, larvae of Dermestes bore their way into books to pupate after feeding on animal material in various situations. Termites, which are primarily timber pests but may turn their attention to books, should be included in this category.

In the second category are cockroaches, crickets and bristle-tails which are occasionally known to cause considerable damage. However, the most serious damage is caused by the larvae of small moths and beetles. The latter mostly belong to the Anobiidae, Dermestidae and Ptinidae. Gastrallus species (Anobiidae), although primarily wood feeders are known to damage books throughout the world.

Other insects encountered in libraries as pests of other materials, include those infesting wooden structures - the termites and beetles (Anobiidae, especially Gastrallus species, Anobium punctatum (Degeer) and Xestobium rufovillosum (Degeer); and those in carpets, curtains etc., including certain small moths and beetles (Dermestidae, especially Attagenus, Anthrenus and Reesa vespulae (Milliron)).

Cases of human allergic reactions to the larvae or larval skins of several dermestid beetles have been recorded, but none to date in libraries. For instance, larvae of the carpet beetles, Anthrenus verbasci (L.) (Ahmed et al, 1981) and A. scrophulariae (L.)

(Cormia & Lewis, 1948) caused human dermatitis in houses and apartments. The spear-headed hairs of related species also caused pulmonary irritation when breathed in large quantities. Dermestes larvae infesting various shipments were responsible for skin lesions and irritation during unloading or unpacking, as well as to laboratory technicians keeping cultures. Since Anthrenus and Dermestes species are known to damage books there is a possibility of librarians and members of the public coming into contact with their larvae and hence they are of potential medical importance.

Before the conservationist or insect control specialist can implement specific control measures they should first identify the pest species involved. This may be achieved by collecting living or dead specimens of the adult, (rarely egg), larval, pupal or nymphal stages and identifying these from keys and descriptions. Often specimens are not available but the signs of a previous attack are visible. The cast skins of dermestid larvae are characteristic as are sometimes the faecal pellets produced by different beetle species. In addition silken tunnels, larval cases or pupal skins may be useful in the determination of Lepidoptera species. Damage symptoms in the covers, bindings or pages, for example the diameter and shape in cross section of larval tunnels and the diameter of adult exit holes are valuable in the recognition of species in the Coleoptera. The important insect pest species occurring in libraries, references to these, descriptions of the characteristic damage caused to books and other diagnostic aids are given in Table 1.

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The saying 'prevention is better than cure' is very appropriate to the library situation. If books are stored under the optimum conditions of 13°-18°C and 55-65% Relative Humidity, several insect pests are deterred. Bansa (1981) highlighted the problems of conservation in areas of high temperature and humidity. A comprehensive account of preventive measures is given by Hickin (1985b) so that these will not be dealt with here. Hickin (1985a & b) included a section on control methods employed against insect pests in buildings.

There are two aspects to control of insects in libraries. First, control of the book-injuring insects in the actual books themselves and second, control of the pests in the immediate environment in which the books are located.

Treatment of the book.

Books from a recent acquistion should be quarantined and thoroughly examined in a separate room in which no other books are stored. Dust and any insects are removed with a clean, dry soft brush. The books should be subjected to a recommended disinfestation process such as fumigation (for other than old books or leather bound books) or the Yale University Deep-freeze technique. Only then should the books take their place in the general library shelves.

Fumigation.

Fumigation is the application of an insecticide in the form of a

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gas, vapour, volatile liquid or solid in the atmosphere of a closed container. This may be a fumigation chamber or a stack covered with gas proof sheets (PVC covered tarpaulins, rolled and clipped) or a building similarly covered. At the end of the fumigation period the tarpaulins are removed and stacked, windows opened and ventilating fans kept running where dead air pockets are likely, until all the gas is removed. No fumigant should be used without the appropriate safety equipment and without training or previous experience in fumigation techniques. For an illustrated account of fumigation in buildings see Hickin (1971). The choice of fumigants is limited and neither Methyl Bromide nor Ethylene Oxide should be used on leather-bound books since these make some leathers brittle. Fumigation is probably less efficient at killing insects within books than the deep-freeze technique. This was clearly demonstrated recently at a library in Jerusalem, Israel, where fumigation with smoke cannisters failed to eliminate an infestation in books by larvae of a Gastrallus species (Coleoptera: Anobiidae) (CIE coll. A18994 (1987)). Tightness of the book text had impaired penetration of the fumigant and many larvae survived.

Baynes-Cope (1981) described the use of chloroform for single, not too large books. The book is stood up fanwise in a container which can be closed and sealed, together with a small jar containing the chloroform. The container is sealed and left for 10 days. It is then opened out of doors. If a large number of books is to be fumigated a professional firm should be consulted.

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FORMAT - Canada's Computerized Information System for Audiovisual Materials

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Audiovisual Materials

Automated Information Retrieval Systems

For internal use only:

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Deep-freeze technique.

Since 1977 Yale University Library has employed a new method of eliminating insects from books (Anonymous, 1978). It was first used on a section of Beineoke Rare Book and Manuscript Library comprising 37,000 books. Only a small number of these were known to harbour insects, but all were subjected to the treatment as a precaution. The books were first sealed in polythene bags and then placed in a blast freezer chamber at -30°C for 3 days. When returned to room temperature they were replaced on the shelves under standard library conditions. The advantages of this method are that no toxic materials are employed and thus there is no possible danger to the staff and the public. This method also eliminates the possible damage to books sometimes caused by chemical reaction of a fumigant with the constituent materials. In addition it causes the least possible disruption to the smooth running of the library.

Disinfestation of the book environment.

Books are often kept in old buildings where the wooden floor-boards and skirting boards have shrunk. Within the crevices produced, the fluff and debris of many years has accumulated. Unless the floor boards are removed and replaced there is no alternative but to scrape out the debris and fill with a non-contracting sealant. In libraries there must be no floor coverings (carpets etc.,) which could provide ideal hiding places for bristle-tails during the day and breeding places for certain beetles.

FORMAT - Canada's Computerized Information System for Audiovisual Materials

by Donald Bidd

Abstract

A national computerized information system for Canadian audiovisual materials known as FORMAT is described. Developed and managed by the National Film Board of Canada since the late 1970s, FORMAT's objective is to promote the use of Canadian A/V material by providing comprehensive, accessible bibliographic information to the library and media communities. A network of private and public sector agencies is feeding an expanding database which is catalogued, coded and indexed according to library standards. Access to the database is provided through a variety of computer-generated media catalogues and the retrieval services of a national online system.

Bookcases and shelving of wood.

It is important to ensure that the shelves and room furniture do not contribute to book infestation and injury by wood-boring insects. In tropical and subtropical areas termites are the main hazard but in temperature regions their place as wood destroyers is taken by beetles, especially Anobiidae. Bookcases and wooden shelving must be chemically treated so as to exterminate the immature stages of wood-boring beetles within the wood and to prevent re-infestation for a number of years in the future. Two wetting coats of a special insecticidal fluid should be applied over all wooden surfaces (top and bottom), preferrably by brush. This fluid is quick-drying and of minimum odour and consists of Lindane in a refined oil solvent with additives to enhance solubility. Where timber is heavily infested with the Death-Watch beetle and many tunnels are connected, some of the flight holes may be injected with an organic, solvent type preservative. Hand injectors ensure the deep penetration of this fluid into the wood.

Termite control and prevention:

In the immediate book environment

Structural timber, wooden flooring etc., should be included in any programme of reducing or exterminating book-damaging pests. The treatment of such parts is usually entrusted to a specialist preservation company under contract.

All wood can be treated to render it immune to termite attack by application of chemical substances. In buildings the most widely used process employs formulation of Copper and Chromium arsenates which are water soluble and which are applied by various pressure impregnation processes. As well as preventing attack by termites such processes render the treated timber immune to wood-boring beetles.

The abrasive quality on insect cuticle of Aerogel (silica aerogel; 'drie-die' and 'Drione') has proved useful against termites and cockroaches, in hot, dry climates such as in California. It is virtually non-toxic to man and has been built-in to buildings being treated with an insecticide dust between partitions and cavity walls. In the USA termites are eliminated from buildings by covering the whole structure with tarpaulins and fumigation carried out. This practice is widespread.

Subterranean termites

Subterranean termites in a badly infested building are usually controlled by drilling the walls and floors at specified intervals and then injecting substantial amounts of water-dispersible insecticide. The holes are then filled in. Where walls are adjacent to earth, a trench is dug along their entire length and specified

amounts of insecticide are sprayed into the trench. Where areas of termite damage in buildings are relatively small, powder injection is in general use in Australia and Malaysia. The termite runways are located and a toxic dust injected into these using a small powder blower. The runways are then carefully closed. The dust usually employed is Arsenic trioxide (white arsenic) with graphite or talc but unfortunately this is extremely toxic to humans. Sulphuryl fluoride, under the trade name 'Vickane', a colourless, odourless gas is used as a fumigant against drywood termites.

The most effective method of controlling existing infestation and preventing future infestation is soil treatment. This involves the application of insecticides to the immediate environment of the building so that termite colonies are unable to sustain themselves in such conditions. In new buildings it is best to treat the soil of the site before construction takes place. All wood, pieces of timber, concrete shuttering, tree roots, vegetation etc., should be carefully removed and burned so that no colonies of termites are on the site before concrete is laid for the foundations. The early insecticides used, such as DDT, Dieldrin etc., gave excellent results but had a residual effect on wild life, sometimes distant to the point of application. Dieldrin, although still in use for control of subterranean termites has in general been replaced by organophosphorus compounds. The specific insecticides used are now under control by national agencies together with precise methods to be followed and safety regulations to be adopted. This would

generally be achieved by utilising the services of a Pest Control Company under contract. An outline of the process with illustrations is given by Hickin (1971).

Table 1. The major insect pests in libraries, their characteristic damage to books & other aids in identification.

	Order, Family, species & Common name	Distribution & References	Damage etc. (& where reported)
1.	Thysanura, Bristle -tails, *Lepisma*	Cosmopolitan Hickin, 1964	General grazing effect on glazed paper. Edges thinned
*	*saccharina* L., Silverfish	& 1985b.	away rather than bored through causing irregular contour to edge of small hemisperical areas 1-2mm. in diameter.
	Lepismodes inquilinus Newn., Firebrat (=*Thermobia domestica* Packard)	Cosmopolitan Hickin, 1964 & 1985b.	General grazing effect on glazed paper (U.S.A.)
2.	Isoptera, Termites	Subtropics & Tropics (1975) (Hickin, 1963, & 1985b.)	Can proceed to complete destruction of books.
*	*Cryptotermes* spp.	Edwards & Mill, 1986 Kalshoven 1930.	
3.	Psocoptera, Booklice		
*	*Trogium pulsatorium* (L.)	Cosmopolitan Hickin, 1985b.	Glue and paste used in book binding eaten but these were probably damp and supporting fungal hyphae, on which they most probably feed.
	Liposcelis bostrychophilus	U.K. Hickin, 1985b.	
4.	Dictyoptera, Blattodea Cockroaches		
*	*Blatta orientalis* L., Oriental Cockroach	Temperate	General browsers. Attack exteriors of bound volumes. Swarms cause fouling of books.
	Blattella germanica (L.) German Cockroach	?Cosmopolitan	
	Periplaneta americana (L.) American Cockroach	Cosmopolitan Hickin, 1964 & 1985b.	
5.	Orthoptera, Gryllidae Crickets		
	Acheta[=*Gryllulus*] *domesticus* (L.), House Cricket	Cosmopolitan Hickin, 1964 & 1985	Potentially dangerous to libraries since swarms often invade buildings and attack
	Gryllus assimilis F. Field Cricket	New World Hickin, 1985b.	wood, leather, paper, cotton, silk etc.

Tineina, Tineidae,
Clothes moths

6. Tineola bisselliella (Hummel), Common Clothes Moth	?Cosmopolitan Hickin, 1964 & 1985b; Freeman, 1980	Larvae eat irregular patches in woollen cloth binding and also silk, covers with silk webbing. Presence indicated by silk tunnels, faeces and and oval cocoons. Binding and paper often bitten out when cocoon being spun.
7. Tinea pellionella L. Case bearing Clothes Moth	?Cosmopolitan Hickin, 1964 & 1985b.	Similar damage to above sp. No webbing since larvae in cases. Pupal case may damage any part of book except leaves.
7a. Tinea ? pellionella		
Tineina, Oecophoridae House moths		
8. Hofmannophila [=Borkhausenia] pseudospretella (Stainton) Brown house Moth	?Cosmopolitan Hickin, 1964 & 1985b. Freeman, 1980	A pest of leather bookbinding Larva forms a channel wherever there is a crease such as between the back and front covers, here it browses on the surface of the leather. It feeds within a few strands of silk and a few faecal pellets.
Coleoptera Dermestidae, Hide and Carpet Beetles.		
9. Dermestes lardarius L., Larder or Bacon Beetle	Cosmopolitan Lepesme, 1944; Hinton 1945; Hickin 1964 & 1985b; Freeman 1980.	Larvae first attack innerside of leather binding making pits, boreholes, perforations. When fully grown bore large tunnels into books to form pupal chambers. Adults and larvae can attack shiny upper surface of cover which then becomes covered with rough 'bald spots'. Beetles dig holes and perforate cover which disintegrates as a result.
8 & 9. Dermestid larval damage to books.		
Dermestes maculatus Degeer, Leather Beetle	Cosmopolitan Lepesme, 1944; Hinton, 1945; Hickin, 1985b.; Freeman, 1980.	
10. Attagenus fasciatus		
Attagenus unicolor (Brahm) Black Carpet Beetle (=A. megatoma F. =A.piceus Olivier)	?Cosmopolitan Hickin, 1964 & 1985b; Freeman, 1980	Especially important in USA. Larvae usually feed on woollen materials. Also damages leather, cloth, silk bindings of books. Upper surface of leather, corners of binding eaten and surface pitted.
11. Anthrenus sp		
Anthrenus scrophulariae (L.), Carpet Beetle	Cosmopolitan Lepesme, 1944 Hinton, 1945; Hickin 1985b.	Larvae may cause damage to old leather bound books.
Anthrenus fuscus (Olivier) Leather Eater	?Holarctic Hinton, 1945; Hickin, 1985b.	On leather bindings but also on paper-bound books with leather spines and corners as well as on book edges.

	Anobiidae		
12.	Stegobium paniceum (L.), Drugstore, Bread or Biscuit beetle	Cosmopolitan Kalshoven, 1938 Lepesme, 1944; Hickin, 1963, 1964 & 1985b. Freeman, 1980.	Larvae feed on dried flour paste on the back of the book and also on the leather of book bindings. Damage to books usually on the cover and adjacent leaves, the boreholes being parallel to the plane of the book. Adult after emergence bites its way out and can perforate a number of grades of paper-leaving exit holes of 1-2 mm diameter.
	Ptilinus testaceus Pic	S.E. Asia Kalshoven 1938.	A pest of books in Malaysia.
13.	Anobium punctatum (Degeer), Furniture Beetle	Cosmopolitan (Palaearctic but widely introduced into other areas in wood). Lepesme, 1944; Hickin, 1963, 1964, 1985b; Freeman, 1980.	Damages: Old books with wooden covers over which another material such as leather, vellum or velvet stretched and fixed (eggs may be laid on book) and almost any type of book stored either on an infected shelf or floor (rarely eggs laid on books). Symptoms of damage: Adults or larvae visible if infected part broken up; Frass cylindrical, pointed at both ends; larval tunnels always circular; adult exit holes circular, 1.5-2 mm diameter; lacunae (broad excavated areas) absent.
14.	Xestobium rufovillosum (Degeer), Death Watch Beetle.	Holarctic Hickin, 1963, 1964, 1985b.	Larvae usually feed on partially rotted wood of broad-leaved trees and structural timbers of buildings Damages: books placed adjacent to infested woodwork; books with wooden covers may harbour the larvae for a time but unusual for them be badly infected unless a fungal rot is present. Symptoms, of damage: Adult exit holes 4-5 mm diameter; frass, large bun-shaped pellets.
15.	Nicobium castaneum Olivier	Holarctic Lepesme, 1944	Attacks dead soft woods and is also a pest of old books and papers. Larvae develop in leather bindings and in parchment where they furrow galleries.

Falsogastrallus (=Neogastrallus) librinacens (Fisher)	New World Hickin, 1985	Larvae when fully grown tunnel into books making galleries slightly more than 1 mm diameter. Old and new books may be infested and the tunnels cut through the binding materials causing the pages to fall out. Pages tunnelled for construction of pupal chambers.
Falsogastrallus natalensis Pic	South Africa (specimens in BM(NH))	Boring in books.
16. Gastrallus sp. Gastrallus indicus Reitter	S.E. Asia Kalshoven, 1938; Husain, 1927-1930.	Damage characterised by a large number of variable sized pin-holes especially in back of bindings.
Gastrallus laticollis, Pic	S.E. Asia Kalshoven, 1938.	Damage as for indicus.
Gastrallus pubens Fairmaire	North Africa (specimens in BM(NH).	Damaging books.
17. Tricorynus [=Catorama] herbarium (Gorham) The Mexican Book Beetle	Neotropical Lepesme, 1944; White, 1963	Rarely damages unbound books Eggs laid on binding or edges of leaves. Larvae upon hatching burrow in search of pasted portions of binding; the binding itself is fed upon by larvae of later instars up to time of pupation. Larvae may tunnel throughout old books of hand made paper, producing circular holes 1.5-2.3 mm diameter and larger oblique holes so that pages are entirely consumed. Larvae feed on the bindings of new books with chemically treated paper. Larvae bore into back of book to pupate. Adult exit holes circular 2-3 mm diameter in back of book.
18. Lasioderma serricorne (F.), Cigarette Beetle	Cosmopolitan Kalshoven, 1938; Lepesme, 1944; Hickin, 1985b; Freeman 1980.	Damages leather, paper, books and book binders paste. Probably damages books only in warmer environments.

	Ptinidae, Spider Beetles	Widespread in Temperate regions.	Damage similiar to Stegobium paniceum.
19.	Niptus hololeucus Faldermann, Golden Spider Beetle	Lepesme, 1944; Hickin, 1964, 1985b; Freeman, 1980	In stacked books the larvae are found mostly on outside of binding between two adjacent books. In books standing on shelves the larvae are usually found on the fly leaf and tunnels are bored towards the binding and the leaves.
20.	Ptinus clavipes Panzer (=hirtellus (Sturm.)) Brown spider Beetle	Widespread in North Temperate zone Freeman, 1980; Hickin, 1985b.	Pest of books in USA. Damage not specified.
21.	Gibbium psylloides (Czenpinski), Hump Spider Beetle	Widespread in Temperate regions. Hickin, 1964, 1985b; Freeman, 1980	Damages paper and wool and known as a pest of books. Damage not specified.
	Gibbium aequinoctiale Boieldieu	Cosmopolitan Lepesme, 1744; Hickin, 1985b.	Possibly a pest of books.

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The use of audiovisual materials depends in a critical way on access to information about these resources. Whether it be a science teacher seeking a filmstrip on water pollution; a film director attempting to find out how a concept has been treated previously before embarking on a potentially expensive production; a librarian needing acquisition information to develop a videocassette collection, access to bibliographic information is a first step in using A/V material effectively.

In Canada, the issue of bibliographic control and access to information for audiovisual materials has been addressed through the development of national and bilingual computerized information system. In the late 1970s, the National Film Board of Canada, a cultural agency of the federal government, took the initiative of developing the infrastructure of a national audiovisual database. This system, known as FORMAT, has as its major objective the promotion of the use of Canadian film, video and other A/V materials through the services of an information system which collects, catalogues and gives access to comprehensive bibliographic data on these productions.

How does FORMAT work? The operations involved in the production and dissemination of the FORMAT database can be described according to three major functions: information gathering, information processing and access to information.

In the initial phase of information gathering bibliographic data is collected through the collaboration of hundreds of information providers -- producers, distributors, government and cultural agencies. These organizations transcribe information for each film, video or multi-media product on a comprehensive data sheet which includes instructions for the completion of certain fields. One of the main sources of information for the database results from the work on the production of Canada's national filmography, Film Canadiana. Through the sponsorship of the National Library of Canada, the National Archives of Canada and the Cinémathèque québécoise, resources are made available to sollicit the participation of information providers across Canada. This collaboration is crucial. As there exists no system of legal deposit for audiovisual material in Canada, the voluntary and systematic contribution of bibliographic data is essential for the effectiveness of the information system.

The second major function involved in developing the database is information processing. The data collected is structured according to a number of library methodologies and standards. For cataloguing, FORMAT uses the Anglo-American Cataloguing Rules, 2nd edition (AACR2); for coding, MARC serves as the record structure and for subject access the PREserved Context Indexing System (PRECIS) has been adopted.

Given the importance of subject retrieval for users of audiovisual materials, a few extra words should be said about the rationale for the choice of PRECIS as a subject indexing system for the FORMAT database. PRECIS was selected because it met a number of important criteria required for effective subject access to A/V productions -- specificity, logic and consistency, an open yet controlled vocabulary, natural language index entries and multilingual applicability. As a system which allows the indexer to formulate an index phrase specifically tailored to the content of each production, PRECIS indexes facilitate the selection process by allowing the users to search under very precise terms and find at any access point a kind of "mini-abstract" of the film or video.

Once the bibliographic data on an audiovisual production has been verified, catalogued, coded and indexed, an automated record is created in the files of UTLAS International, Canada's largest bibliographic utility. The use of this national online cataloguing network means that hundreds of libraries have access to the records for derived cataloguing purposes.

These information gathering and processing activities have resulted in a database which now numbers over 20,000 bibliographic records and an authority file listing over 3,000 Canadian producers and distributors. This authority file plays an important role in the information service as

as it tells users where they can obtain the productions recorded in the bibliographic file.

Access to the information in the FORMAT database is provided through two means: computer-generated media catalogues and direct online information retrieval. An active database publishing program has resulted in the distribution of a variety of film and video catalogues. Such major bibliographic tools as Film Canadiana, Canada's national filmography, Copie 0: courts and moyens métrages québécois, and the catalogues of the National Film Board collection are produced by FORMAT. A number of specialized thematic catalogues in such areas as family violence, industrial relations and women's issues are also generated in response to specific programs or information projects.

Direct online access to the database is presently available to all reference staff in the national network of NFB audiovisual libraries across Canada. The online system allows for the retrieval of information on any combination of over 20 search criteria. A typical query, such as a request for videos on the subject of nuclear energy between 20 and 30 minutes in length and produced in the 1980s can be answered quickly through the appropriate combination of criteria in the search strategy. In the coming months, the database will be available for direct online access to agencies such as media centres, public, school and university libraries and film industry organizations through the services of a major Canadian database vendor.

The development of FORMAT as an information system for audiovisual materials has had a very positive impact on the objectives of national bibliographic control and promotion of Canadian films and videos. The combined effect of the publication of widely distributed media catalogues and the delivery of online reference services has meant that thousands of programming and information requests, both from Canada and around the world, can be satisfied.

The theme of this 53rd General Conference is "Library and Information Services in a Changing World." One indisputable reality of this "changing world" is the presence and power of audiovisual media as carriers of information and culture. In Canada, the development of a national audiovisual database has illustrated the crucial role of the knowledge base of library science and the professional service of librarians in bringing audiovisual materials into the hands of the community of users.